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CONTENTS

A BRIEF HISTORY OF WAR GAMING

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A BRIEF HISTORY OF WAR GAMING

INTRODUCTION

Operations Research, in its continued application, finds itself
turning increasingly to a new research tool; that of operational
gaming. Because of the considerable amount of research being done
in the military field, particular attention has been directed to-
ward War Gaming. Such attention has led to this inquiry into the
history of War Gaming as a military practice, and its development.

In the interests of brevity, only the salient developments have
been noted in this article. Specifically, the war game has been
traced from very early times, when it was treated as a modified chess
game and used principally for pleasure, through a period when it
began to gain in importance in the military profession. As the value
of the game grew, so did its complexity. This led to a significant
separation in the types of games played, which became the "Free
Kriegsspiel" and the "Rigid Kriegsspiel." The "Free Kriegsspiel" was
used extensively and developed into the Map Maneuver which remains
as an important form of military training to..y. On the other hand,
the "Rigid Kriegsspiel," after languishing in a long period of relative
neglect, has experienced a rebirth as a modern research tool which
offers promising future possibilities.

ORIGINS

It is of interest at this point to define the terms "war games,"

"map maneuvers," and "Kriegspiel," which will be used in this paper.
An inclusive and concise definition may be proposed as: an imaginary
military operation, conducted upon a map or board, and usually employ-
ing various movable devices which are said to represent the opposing
forces, and which are moved about according to rules representing
conditions of actual warfare.

Actually, the special idea of a game of war has existed since
the dawn of history. The ancient game of chess, probably invented
by an Oriental soldier, is believed by many to be the oldest form of
war game. The origin of chess is doubtful, but is usually ascribed
to India where it appeared as a Hindu battle game called Chaturanga.[1] [2]
This early game was played on a board, a highly conventionalized map
using various pieces to represent the arms of the service then in
existence: elephants, horses, chariots, and foot soldiers. Played
by four persons according to fixed rules, the game required the use of
dice in order to determine the effects of the various moves. It is
generally presumed that the game represented a moral equivalent for
actual battle, a safety valve for the belligerent Hindus, and that
it was a fair representation of the conditions as they then existed
in warfare.

The games of draughts and checkers, which are similar to but
simpler in form than chess, are perhaps many years older than chess.
However, it is evident that all of these games are dependent on the
military principle of decision at the most advantageous moment.

In 1664, Christopher Weikhmann invented, at ULM, a modification

2

of the game of chess which he called the "Kings Game."[2] This game employed thirty pieces on each side: 1 king, 1 colonel, 1 marshal, 1 captain, 2 knights, 2 chancellors, 2 heralds, 2 chaplains, 2 couriers, 2 adjutants, 3 bodyguards, 3 halbardiers, and 8 private soldiers. The pieces had fourteen different kinds of fixed moves similar to those in chess. Somewhat popular among the Germans, the game was developed from chess because of the prevailing belief that chess offered training in mental and moral discipline.

During the reign of Louis XV, from 1710 to 1774, two card games appeared: Le Jeu de la Guerre and Le Jeu de la Fortification.[3] In these games the military symbols were printed on cards, and they appear to have been used primarily to help teach military students basic military facts. Copies of these card games are said to exist in the English War Office.

EARLY DEVELOPMENTS

The early part of the 18th century saw only minor changes made in the kinds of games being played. This is not surprising, since their value to the military profession as training devices for tactics and strategy had not yet been fully recognized, and their identification with chess was still too strong for them to be used for anything but a pleasant pastime.

During the latter part of the 18th century, however, there developed an increased emphasis on warfare as an exact science; a branch of applied mathematics resembling geometry.[3, 4] The methods of exact science, particularly mathematics, were being

3

applied t̶ ʷary phase of warfare. This g̶ave ri̶s̶e̶ to what was called the "vogue of Military Mathematics;" it being axiomatic that above all a military leader must be a great calculator. The possession of a great amount of mathematical knowledge became the criterion of a ɪeau...ʳ's merit.[4] Von der Goltz has said of this period,[2] "A true ꞉trategist of that epoch did not know how to lead a corporal's guard across a ditch without a table of logarithms." Battles were no l̶onger fought from motives of patriotism, but for art's sake, and it was deemed preferable to forego victory, rather than to achieve it by unscientific methods.[4] It was inevitable that the games which were created during this period would tend to reflect the mathematical thinking and the theories of warfare which were then prevalent.

One such game appeared in 1780. Essentially a modification of the game of chess, it was invented by Hȯ̶ɪꞷig, a master of pages at the Court of Brun꞊rick.[2],[5] The game was intended to instruct the pages in the art of warfare, since many of them were destined for military service. The game employed a modified chessboard containing 1666 small squares, 3 centimeters on a side, with each square tinted to represent various features of the terrain. Troops were represented by pawns similar to those in chess. The board was divided into two sides, each with a fortification which took the place of the king. The object of the game was to capture the opponent's fortification, and the troops marched and fought according to fixed rules much like those in the chess game.

It was not long before additional modifications of chess appeared. In fact, most of the games of this period reflected the influence of chess to such an extent that they were called "War Chess." Perhaps the most notable example was the game proposed by George Vinturinus, a famous military writer and tactician at Schleswig.[2], [4] Published in 1798, the game was called the "New Kriegsspiel," and employed a board or chart divided into 3600 squares. Here again, pawns were used to represent troops. The moves attempted to approximate the ordinary marches of troops, and the configuration of the ground was taken into account in a crude way. In keeping with the technical theories then prevalent, sixty pages of rules governed the movement and fighting of the troops, transforming the game into an extremely complex and tedious exercise. As a result, it was received with enthusiasm by many members of the military profession.

The game of Vinturinus did not go without criticism.[4], [5] Von der Goltz has said the game, ' . . . (ic) . . . is a bad product of the refined military education of the time, which has piled up so many difficulties that it was incapable of taking a step in advance. . . . A science of war as conceived by Vinturinus does not exist."

The vogue of Military Mathematics, and the "chess" type war games which were associated with it, continued until Napoleon's armies swept across Europe. Napoleon's victories held little respect for the prevailing concepts of waging war, and effected a

5

temporary cessation in the use of the war game. It should be noted, however, that Napoleon is said to have worked out his own campaigns by maneuvering pins with colored heads over maps of the scene of operations, an action which may have been significant as a forerunner of later German methods.[6]

DEVELOPMENT IN THE 19TH CENTURY

It was only a short time after the defeat of Napoleon that attention was once again directed toward the development of the war game, incorporating the lessons learned from those wars.

Perhaps the first significant one was that invented by Herr von Reiswitz, the Prussian War Counselor at Breslau.[2,5] In 1811, he transferred the game from the chessboard to the sand table, producing what may be considered the prototype of the modern war game. Wooden blocks were used to represent troops, and the terrain was modeled in sand to a scale of 1:2373. Symbols were painted on the blocks to represent the various branches of service. At the request of King Frederick Wilhelm III, von Reiswitz, a few years later, made an improved model with the terrain modeled in plaster in relief, also to a scale of 1:2373. The woods, trees, villages, etc., were shown in colour, and the troops were represented by porcelain blocks with painted symbols. His game became very popular at the King's court.

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6

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The honour of originating the war game as we recognize it today, however, should really be given to von Reiswitz, Jr., who

acquired his father's prediliction for the game. As a First
Lieutenant in the Prussian Guard Artillery, he, in 1824, conceived
of the idea of adapting the game to actual military operations, and
transferred the game to realistic map-like charts with a scale of
1:8,000.[5] He published a set of rules which he called, "Instruc-
tions for the Representation of Tactical Maneuvers under the Guise
of a War Game." He found influential patronage in Prince William,
the future emperor, who called the attention of his father, King
Wilhelm III, and Marshal Meffling to the game. Marshal Meffling
exerted considerable effort toward having the game introduced into
the army, and issued instructions to the effect. At the same time,
King Wilhelm, by royal command, ordered the game to be adopted by
the Army. Meanwhile von Reisswitz, Jr., was instructed to produce
more maps, since it was recognized that the value of the game de-
pended to a great extent on the quality of the maps used.

The war game of von Reisswitz, Jr., employed an "ideal" map
or chart, to a scale of 1:8,000, showing approximately four miles
of ground. Troops were represented by pieces of lead, coloured
red and blue for the opposite sides, and painted with the symbols
for the various branches of the service. In playing the game, an
original situation was given in writing to the opposing commanders
by the director or umpire, together with such special information
as it was supposed by the umpire that each side would normally
possess about the other in battle. Only such troops as were ac-
tually considered visible were represented on the map. Orders,
reports, and information were transmitted in writing through the umpire,

7

who attempted to maintain a realistic time interval for their transmission. A time interval of two minutes was allowed each side, with only such movements made as would realistically be possible in this time in actual battle. Rates of movement were judged primarily by the umpire or director, and the losses or the outcome of engagements were determined by throws of the dice.

Several notable improvements in the war game now become evident. An attempt at limited intelligence was introduced into the game, together with a more realistic control of the movements of the troops. Also, the chessboard type of chart was finally abandoned, with increased attention being given to the use of charts which would more faithfully represent actual terrain.

The popularity of von Reisswitz, Jr., aroused a great amount of jealousy among his fellow officers and his superiors. This resulted in his being transferred to a border fortress at Torgau. He is said to have interpreted this as a disgrace and committed suicide there in 1827, leaving it to others to improve his game and develop it further. Although his work remained the standard for over half a century, there existed a general lack of understanding as to the conduct of the game. To overcome this, many changes and modifications were made, with numerous rules and codes being added to the game. Although later men such as von Tschischwitz, von Trotha, Naumann, etc., attempted to prune off some of the useless appendages, most of them served only to make the game more complicated and tedious.

Because of the increasing degree of complexity being built into

8

the game, von Reisswitz' game did not attain the extensive popularity
and use which had been expected of it. The game was played mainly in
clubs formed for this purpose at some of the larger garrisons, such as
the Magdeburg Club, the later Berlin War Game Club, and clubs formed
by the officers of the Prussian Guard Artillery.[2/] During this per-
iod, Count von Moltke, an outstanding military man and Chief of Staff
of the Prussian Army, was an industrious player of the game, and was
the founder and president of the Magdeburg Club in 1850. He exerted
intensive efforts toward the promotion of the game, but was contin-
ually confronted with a general lack of acceptance.

It was in 1876, that a major shift in emphasis was brought a-
bout by the work of Verdy du Vernois.[2/], [5/] As an eminent instructor
in the Prussian Army, he called for a free conduct of the game, un-
obstructed by rules and calculations, and paved the way for a sep-
aration of the game into what is now known as Free Kriegsspiel and
Rigid Kriegsspiel. The result was the creation of two schools of
thought, representing opposite views on the method of conducting the
game.

FREE KRIEGSSPIEL VS RIGID KRIEGSSPIEL

The Rigid Kriegsspiel was essentially a continuation of the types
of complex games which had been played up to this time, together with
numerous modifications and alterations. Its adherents studied war-
fare, and particularly the wars of 1866 and 1870-1871, gathering ex-
tensive information, and formulating tables and data from this infor-
mation. They attempted to systematize the rules of the game and

9

provide tables and data which would facilitate easier application of up-to-date information to the game and accelerate the calculations necessary to the progress of the game. A notable development was provided in 1877 by Naumann in his book, "Das Regiments-Kriegsspiel," in which he proposed the use of a "standard," based on the data collected, with a "multiplier" being applied to this standard in order to account for the variations in conditions.

The Free Kriegsspiel originated in three works: the "War Game Studies," published by Meckel at Hanover in 1873; the "Instructions for the War Game," also published by Meckel in 1875; and "A Contribution to the War Game," published by Verdy du Vernois as Chief of Staff in 1876.

In his books, Meckel favoured the war game as a means of instruction, and asked for extensive changes in its conduct, including the emancipation of the director from the many rules and the limited use of tables and dice. It was von Verdy who initiated the move toward a free play of the game, requiring the director to judge the effects of fire and to administer the progress of the game entirely on the basis of his own experience. Von Verdy soon after published a concrete example, anticipating Meckel's intentions, and making it unnecessary for Meckel to do this.

With the separation in the method of playing the war game, it is of interest to note that at this time the game had assumed three essential forms. In one form, the game still existed to some extent as such; a game, similar to chess, and played purely for pleasure,

10

with little future value to the military profession. As such it was diminishing in importance and in its use. In another form, it also existed as the Rigid Kriegsspiel, with minute attention being directed toward all the details of warfare, and with complex tables, charts, and calculations necessary in order to play the game. Although of potential research value to the military profession, as yet unrecognized, the game proved too complex and tedious to be used frequently for training purposes. The third form of the game, gaining rapidly in popularity and use, was that of the Free Kriegsspiel, conducted entirely free of tables, charts, or calculations, and easily applicable to instruction and training.

THE WAR GAME IN VARIOUS COUNTRIES[2]/

It should be noted at this point that the major portion of the use and development of the war game has taken place in Germany. It became necessary, however, to trace briefly the introduction of the war game into the armies of various other important countries.

ENGLAND: In 1872, Captain Baring, of the Royal Artillery, introduced the game into England by publishing a set of rules based mainly on the works of von Tschischwitz. Orders were issued in 1883 by the Duke of Cambridge, marking the official introduction of the game into the English Army, and rules for its play were incorporated into the British Field Service Regulations. However, the practice of the game was not made compulsory.

The maps used in England were to scales of 1 inch to the mile

11

and 6 inches to the mile. It was fortunate that at this time most of Great Britain had been mapped to these two scales. The war games played in England were customarily begun on the 1 inch map, and so conduted that the concluding part of the game would locate itself near the garrison in which the game was being conducted. The game was then finished either on the 6 inch map, or on the ground close to the garrison as a field maneuver.

The Naval war game was also developed to a considerable extent by the British Naval Office during this period. This is not surprising, if England's traditional emphasis on sea power is considered.

AUSTRIA-HUNGARY: Austria-Hungary was attracted to the game soon after the Prussian successes in the war of 1866, and the game was made obligatory among officers and cadets during the winter months. Three hours per week were devoted to playing the game.

ITALY: Instructions were issued by the General Staff in 1873, marking the introduction of the game into the Italian army. The type of game played in Italy was based mainly on the works of von Trotha. As such, it was of the Rigid Kriegsspiel form of game. Usually played in the third and senior years at the War College, the game was used primarily for training in logistics and general staff work, and required forty evenings of instruction for the course.

FRANCE: In 1874, Cramer, a printer and publisher and ex-professor at the University of Kiel, attempted, unsuccessfully, to introduce Helwig's early war chess into France. In 1889, the contemporary type of war game was finally incorporated as a means of instruction at the

French War College. The practice of the exercise was not made obligatory until 1900, when orders were issued to this effect, and the use of the game was extended to include regiments and garrisons.

RUSSIA: In 1875 and 1876, orders were issued in Russia requiring the instruction of officers by means of the war game, or, as they were then beginning to be called, map maneuvers. During this same period, the Naval war game also appeared at St. Petersburg and was frequently played. Used primarily for training and examination, the war game was allotted fifteen evenings during the winter months. Russia, however, was confronted with several serious problems in the use of the game, including a general lack of interest, a shortage of competent and experienced directors, and an appalling lack of basic military knowledge on the part of the participants.

TURKEY: The exact date of the introduction of the war game into Turkey is not known. However, the game was prescribed in the Field Service Regulations of the Turkish Army. Many of the officers of the Turkish Army were being trained in Germany, where they became acquainted with the war game. On their return to Turkey, they brought with them the practice of the game.

JAPAN: The war game was introduced into Japan by Meckel, bringing with him the Free Kriegsspiel method of play. Translations of Meckel and von Verdy were used to a considerable extent, and the game was emphasized by the War College. It was felt that many of the successes of the Japanese army in the Russo-Japanese war can be attributed to training received in playing the game.

13

THE WAR GAME IN THE UNITED STATES

The introduction of the war game into the United States can be
traced to the early part of the 19th century when several elementary
tactical games appeared.[3/] One of these, published by Robert Smirk in
1811, was called the "review of a Battalion of Infantry." During the
Civil War, several sets of so-called "tactical blocks" appeared,
called "The Automaton Regiment," "Company," and "Battery." These
were produced by Captain Douglas Brewerton. For a time, Royal Chess
was played in this country, employing two to four sets of chessmen
with an equal number of boards. It is believed that the game was
based on some of the earliest forms of Kriegsspiel, perhaps Helwig's
game, and was probably studied from the originals, since no trans-
lations can be found and little information exists regarding their
practice. Other games included "War Chess, or the Game of Battle,"
published in 1866 by C. B. Richardson and Company, and "Militaire,"
the invention of Reverend Wilhelm of Pittsburgh, Pa., and published
in 1876 by J. B. Lippencott and Company. Very little information is
available concerning most of the early 19th century games in the
United States.

The first important work appeared in 1883, in a book published
by W. R. Livermore, a Major in the U.S. Corps of Engineers.[6/] This
work, called "The American Kriegsspiel," was based mainly on the
writings of von Tschischwitz as translated by Captain Baring into
English.

The apparatus which Livermore used included an "ideal" geographical

14

or topographical map, with coloured blocks to represent troops. A "general problem" was stated in writing by the game director, with "special situations" and limited intelligence given to each side. Livermore proposed the use of three maps, with three rooms, having each side possess only such knowledge of the opponent's forces and movements as it would normally be expected to acquire in actual operations. Only such troops as would normally be seen, or about which information could reasonably be expected to exist, would be shown on a side's map.

A record of the progress of the game was kept by the director on a large board called the Firing Board. Charts were used (Figure 1, page 27). detailing the rates of movements for the various branches of the service under varying conditions, and tables, based on logarithms, were used for the calculations of losses and the effects of fire. The system employed was an improvement of that proposed earlier by Naumann, using the standard and the multipliers (Figure 2, page 29). Much of the data and information used by Livermore was obtained from the Civil War and the Wars of 1866 and 1870-1871. Minute details were included in the calculations, such as the effects of fire, fatigue, the state of training of the troops, morale, the variations in terrain, etc. These were all accounted for by the use of the multipliers which modified the normal value according to the variations in conditions. Dice were used to determine the results of uncertain chance occurrences. The game of Livermore was essentially a more up-to-date, and a more complex, version of the

15

early game of von Reisswitz, as interpreted by von Tschischwitz.

At about the same time that Livermore's work appeared, another book called "Strategos"[3]/ was published by Lt. C. A. L. Totten, of the 4th U. S. Cavalry. This book was scheduled to appear in 1880, but due to difficulties in publishing, did not appear until about 1895. Although Livermore insisted that Totten's work was essentially a translation of the German Kriegsspiel, Totten claimed that he created the original work independent of any study of German methods. However, during the period in which publishing was delayed, Totten did compare Strategos with some German works, an is said to have incorporated some of the better features. Totten asserted that his work is better than any German game, or the American Kriegsspiel, since Strategos is actually divided into two parts: The Battle Game and the Advanced Game. The Battle Game was provided for beginners, and teaches basic movements and formations. The Advanced Game, which was very similar to Livermor 's game, would be used by more advanced students. The absence of a beginner's game in the earlier types of war games was a lack which Totten felt he had overcome.

The apparatus used by Totten in the Battle Game consisted of a chess type of game board, 48" x 40", on which blocks which represented troops were played with fixed moves such as those in the chess game.

Maps or charts were used for the Advanced Game, with a scale of 5 to 10 inches to the mile. Moves were made according to time

16

and distance figures given by various charts and tables such as
those in Figure 1., and losses due to fire were again calculated by
applying multipliers to standards in order to account for various
conditions (see Figure 2.). Messages and orders were written and
transmitted through the director, with allowance being made for the
passage of time. In general, the game was very similar to the Amer-
ican Kriegsspiel of Livermore, except, perhaps for the fact that the
great bulk of Totten's data and charts were based on information ob-
tained from the American Civil War.

The games of Livermore and Totten were received with as little
enthusiasm in the United States as was the game of von Reisswitz,
and the Rigid Kriegsspiel, in Germany and the rest of Europe. It
was inevitable that the dichotomization of the game in Europe, with
the appearance of von Verdy's work, would eventually be repeated
in the United States. Perhaps the most influential in bringing this
about was Eben Swift,[7] of the 5th U. S. Cavalry, who in 1897 trans-
lated von Verdy's "A Simplified War Game," thereby introducing the
Free Kriegsspiel to the U. S. Army.

During this same period, the Naval War Game was suggested
by Lt. Wm. McC. Little[6] and received an increasing amount of atten-
tion. A "Coast Artillery War Game" was also published in 1916 by
Major Wm. Chamberlaine. These games employed blackboards, sheets
of paper or charts, or maps placed on large tables, in order to
illustrate coast lines, oceans, harbors, etc., and miniature boats
were used to represent real ships. Tables and charts were devised

17

to ascertain movement and the effects of a fire fight.

Two additional developments appeared at about this time in the United States.[8] The first was the use of celluloid sheets (or overlays) which were placed over the maps, and on which the formation and movements were drawn in wax pencil. This eliminated the need for blocks, and had a distinct advantage in that a historical record of the game could be kept by using successive sheets of celluloid. The second development was the so-called "Single Handed Exercises," in which the director acted as the commander of one of the sides, and so led the exercise as to illustrate tactical and strategic principles of his own choosing in order to instruct the student commander of the opposing side.

THE WAR GAME IN THE EARLY 20TH CENTURY

The early 20th century saw an increased use of the von Verdy type of war game, the Free Kriegsspiel, with a corresponding relative neglect of the Rigid type of Kriegsspiel. There also occurred a definite trend toward the use of maps of actual terrain, drawn to a suitable scale; breaking away from the "ideal" maps of von Reisswitz, Livermore, and even Meckel.

Two additional works attempted to clarify the methods of playing the Free type of war game. One of these was the work of Frederick Immanuel[9] who published "The Regimental War Game" in 1907. In this book, Immanuel emphasised the importance of a competent director, and advocated the free play of the Verdy system.

18

Inasmuch as he felt that the previous war games focused too much attention on the play of large forces, Immanuel introduced a game which he asserted could be adapted to the play of Regiments, Battalions, and even Detachments. Immanuel adopted the tables with scales of movements for the various branches, and pointed up the importance of a realistic feeding of intelligence into the game. This, of course, was left to the judgment and experience of the director. Immanuel used maps with scales of 1:6250, 1:8000 and 1:10,000; using blocks to represent troops. The outcome of engagements was left to the judgment of the director. Immanuel did not insist that the game be played to the very end, since he felt that no useful instruction is gained by this practice.

The other work to appear during this period was that of Farrand Sayre, who published, in 1911, a book called "Map Maneuvers and Tactical Rides."[2] Also an advocate of the Free type of play, his system was very similar to that of Immanuel, except that he used a simplified chart in order to calculate the effects of fire, again employing the standard and multiplier method. (see Figure 2 .)

During this period, many field trips in Germany were supplemented or replaced by map maneuvers.[10] Many of these, rather significantly, took place in the border countries surrounding Germany. Graf von Schlieffen, as Chief of Staff, was prominent in many of the trips and map maneuvers. A brilliant tactician and military leader, he attempted to solve the problem of war on two fronts, which he considered inevitable for Germany in any future wars. He

wrote many books intended for the training of officers, and still
stands today as a classic teacher in the art of warfare.

THE WAR GAME: 1914 - 1945

Probably the greatest use of the war game, in the past half
century was made by the Germans.[10/] Their Spring offensive in 1918
was rehearsed by means of a map maneuver, which showed how slim the
chances of success were. The years after 1918 saw the war game be-
come an essential part of the German Army training programs. This
was principally due to the allied restrictions placed on the size
of the German Army and the amount of funds available after their de-
feat. Since they were not able to conduct field maneuvers to any
practical extent, the Germans were forced to turn to map maneuvers
for the training of troops, and for the advanced training of offi-
cers in the art of making decisions and issuing orders. The war
games which resulted were of a very high quality. It should be
noted, however, that they were all essentially the von Verdy type of
exercises.

It was at some time during these years that Field Marshall von
Blomberg is said to have conducted a series of top-secret strategic
war games in which he attempted a solution of the existing problems
of the defense of Germany. No records are available of the details
of these games. A reorganization occurred soon after, which involved
the dismissal of Blomberg and others who may have had knowledge of
what questions were answered with these games.

20

Generaloberst Beck, usually considered as Schlieffen's successor, was also prominent in the use of war games. Strongly protesting Hitler's decision to invade Czechoslovakia, he attempted to support the reasons for his objections by means of a war game. The game did, indeed, confirm the opinions he held. However, the results of his game apparently were not borne out by later events. Beck also, in 1940 was instrumental in conducting another game involving the German invasion through the Ardennes. The exercise was so well conducted, in this case, that everyone was thoroughly rehearsed in the job he had to do and the problems he had to solve. The actual campaign was then conducted with astonishing ease; in fact, the Germans assert that it came off easier than they had expected, due to their over-estimation of the Belgian and French Air Forces.

In November of 1944, Field Marshall Model again conducted a map maneuver with the Ardennes as the setting. However, in this case the situation was reversed. The Allies were poised for the attack and the game constituted an attempt to determine the defensive tactics necessary to hold the American forces. Soon after the game began, the attack occurred, and Model ordered that decisions as to necessary actions were to be made directly from the game room, thereby converting an imaginary game into stern reality.

Two additional uses of the map maneuver were made in Germany during World War II. The first was called the Otto Map Exercise, involving Operation Barbarossa, the invasion of the Ukraine. This

exercise, like the earlier Ardennes game, proved high profitable. The second use of the game was in Operation Seeloewe, the invasion of England, which pointed up the many technical difficulties which demanded solution before any crossing of the English Channel could be attempted.

Essentially three types of games were being played in Germany during this period, although they may all be classified as employing the von Verdy method of Free play. The first was the Minor Tactical Game, played on maps 1:5000 - 1:8000, and involving forces up to brigade strength. The second was the Great Kriegsspiel, played on maps of 1:15,000, and involving forces of brigades, divisions, and larger. The third type was the Strategic War Game, played on maps up to 1:100,000, and involving armies and army groups. These Strategic War Games were usually top-secret, and many of the industrial, political, and business leaders of Germany were invited to participate, together with members of the Propaganda Ministry.

Very little development occurred during this period in the United States. Although a considerable amount of instruction and training was being accomplished by means of the map maneuver, the emphasis was focused on the CPX, or field maneuver. In 1938,[1] H. G. Wells published a book called "Little Wars" in which he proposed the use of a large space, such as a drill hall floor, on which the terrain was built up in wood, with painted shrubs and twigs used to represent trees and forests. He proposed lead soldiers for troops, and toy guns which actually emitted projectiles. Intended originally

22

as a child's game, it proved too cumbersome for military use, although many of the features of the game were adopted for the sand table.

Also in 1938, E. A. Raymond of the Field Artillery Reserve, proposed a similar game, employing a board, 4' x 10', with contours built up in cork, and painted terrain features. Miniature ships, tanks, guns, etc., were made of molded rubber. Effects of fire were calculated on the basis of range and chance, using dice. Although this game, like that of Wells, was not extensively used, many of its features were also adopted for the sand table.

MODERN WAR GAMING

It was von Neumann who, in 1927, supplied the theory which was used by others to initiate a renewed interest in and a renewed awareness of the potentialities of the "rigid" type of war games.

Describing a conflict situation as one in which the consequences of a decision are not only dependant upon the actions of the decision maker, but upon the actions of an opponent as well, von Neumann developed the minimax principle for making decisions in such situations. He proposed a model for the conflict situation which he called a game. In war gaming, the model is made to approximate actual battle situations, and the similarity of the model and reality makes possible a translation of the predictions of the model to the real situation.

In 1944, von Neumann and Oskar Morganstern published an

23

extensive account of game theory in their "Theory of Games and Econom-

ic Behavior." The rigorous treatment applied to games by their

theories has been transferred to war gaming, providing for a scien-

tific analysis of decision making in warfare with a considerable

future potential. Called "operational gaming," extensive explora-

tion is continuing today in efforts to expand the possibilities and

uses.

At the present time, there exist many types of war games.

However, for the present discussion, the distinction between "free"

and "rigid" will be retained.

The "free" war game, or map maneuver has continued to in-

crease in importance and use. Since almost every operation of war,

from a small-scale patrol to the conflicts between whole armies can

be represented, the war game affords considerable opportunity for

examining the methods of conducting war. Perhaps the primary and

most frequent use of the exercise is for training purposes. Its

value here is unquestioned and has stood the test of time. By its

use, military men can be trained for leadership, using the game for

such subjects as formations, tactics and strategy, organization of

combat forces, and decision making and order giving. The men who

are to fill staff positions can be trained in such subjects as lo-

gistics and the organization of rear echelon troops.

Another important and very frequent use of the free type of

exercise is in the planning of operations. Its value as a planning

tool has been thoroughly proven both by the Germans and the Allied

24

Forces during World War II. Even now, the deployment of the occupation forces in Europe is being planned to considerable extent with the aid of map maneuvers.

The growth of the "rigid" type of game, from the prototype of von Reisswitz, and from those more sophisticated games of Livermore and Totten, with the added mathematical power given to it by von Neumann's theories, has been rapid during recent years. It has developed into a potentially powerful research tool, used to test new combat principles and organizations.

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26

Infantry, marching on roads .... 1000 m. in 12 minutes
Infantry, advancing to attack............... 1000 m. in 10 minutes
Cavalry & Field Artillery at a walk......... 1000 m. in 10 minutes
Cavalry & Field Artillery, trot & walk, Alt.... 1000 m. in 6 minutes
Cavalry & Field Artillery at a trot......... 1000 m. in 4 minutes
Cavalry & Field Artillery at a gallop....... 1000 m. in 2½ minutes
Cavalry charging............................ 1000 m. in 1½ minutes

Average Time (500 m.)

Infantry, marching................ 6 minutes
Infantry, advancing to attack..... 5 minutes
Cavalry, trot..................... 2 minutes
Field Artillery, trot............. 2 minutes
Cavalry, gallop................... 1¼ minutes
Field Artillery, gallop........... 1¼ minutes
Cavalry, charging................. 3/4 minute

Messenger (officer) .... 1000 m. in 2½ min
Messenger (XX)................. 1000 m. in 3½ min.
Messenger (XXX)............... 1000 m. in 4½ min.
Cyclist (on roads) .... 1000 m. in 2 min.
Automobile .... 1000 m. in 1½ min.

Figure 1. Sample of scale of movements, in meters, as given by Immanuel in "The Regimental War Game." Similar scales were used by Livermore and Totten.

27

Figure 2. Sample of multiplier chart of the type used in early war games. Based on Sayre's work, the standard, at 1.00, indicates that one company of 128 men, deployed and fired upon by another company of equal strength, will lose one man per minute, assuming the various factors as listed in the column under 1.00. If, for example, the firing troops were employing rapid fire, the standard is multiplied by 1.20. Successive multiplications are carried out to take into account all the various factors.

	.10	.25	.50	.60	.80	1.00	1.20	1.60	2.40	10.00
MULTIPLIERS	.10	.25	.50	.60	.80	1.00	1.20	1.60	2.40	10.00
RANGE		1500	1200	1100	1000	900	800	700	500	100
RATE OF FIRE						6/min		rapid		
POSITION					standing	lying	rest			
CONDITION				fatigued		fresh				
INSTRUCTION			recruits			average		sharp-shooters		
MORALE			surprised		shaken	unshaken				
ANGLE						90 deg.	60 deg.	45 deg.		
FORMATION		5 yds int.		2 yds int.		2 paces int.		1 man per yd.		
POSITION		trench	wood			lying		kneeling		standing

Troops firing — MULTIPLIERS, RANGE, RATE OF FIRE, POSITION, CONDITION, INSTRUCTION, MORALE

Troops fired on — ANGLE, FORMATION, POSITION

Figure 2

29

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